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(54) Applications for information transmitted in the vertical retrace interval of a television signal.

(57) Methods of and apparatus for processing television signals wherein the television signals include image-representative information and a plurality of segments of accompanying supplementary information including VPS program identification information and a teletext listing including program title information and program source information encoded during vertical blanking intervals wherein the VPS program identification information is decoded and the teletext listing and included program identification information are also decoded, the program identification information from VPS and teletext are compared and thereafter at least program title information is displayed upon identifying matching information.

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NEW APPLICATIONS FOR INFORMATION TRANSMITTED IN THE VERTICAL RETRACE INTERVAL OF A TELEVISION SIGNAL

BACKGROUND

The introduction of VPS (Video Program System) and VPV (Videotext Programmed VCR), now also called VPT (Videorecorder Programming by Text), in Europe opens new opportunities for increasing the user-friendliness of today's TV receivers. Apart from simplifying the programming of VCRS, for which the two systems originally were intended, further features can be provided in connection with the teletext service. Automatic station name identification and the display of the title of the current program will be described.

The original purpose of adding the VPS signal to the image-representative TV broadcast signal was to simplify the use of home video recorders. Prior to VPS, these recorders were programmed by means of a timer, which started and stopped the VCR according to the time when the desired TV program of interest was scheduled for transmission.

Occasionally, the program of interest could not be correctly recorded, for example due to delay in the completion of the previous program.

The VPS signal was intended to overcome this drawback by providing an accurate indication of the starting time of a new program. Some properties and the data format of the VPS signal are shown in Fig. 1 of the drawings and are briefly explained below. A more detailed description is available in the literature, (see for example, "VPS-Ein neues System zur beitragsgesteuerten Programmaufzeichnung", Rundfunktechnische Mitteilungen, Heft 4, 1985).

On data line 16 in the vertical blanking (retrace) interval of the TV broadcast signal, the VPS program identification code occupies 4 bytes (11 - 14). The related information of these 4 bytes is shown in Fig. 2 of the drawings, where bits 2 - 21 specify day, month, hours and minutes of the originally scheduled start of the transmitted program. Bits 22 - 25 denote the country and bits 26 - 31 denote the transmitting station or program source. Fig. 3 of the drawings illustrates the assignment of the country codes to Europe, North Africa and Middle East according to a proposal of E.B.U. (European Broadcasting Union). Although the same code is used by several countries, no interaction occurs since the countries which have the same codes are far away from each other.

Fig 3a. illustrates an example of the appropriate codes for the German network ZDF. The country code is 13 or HEX D and a total of sixty-three program sources are conceivable, some of which are listed. Bits number zero and one (see Fig. 2) specify four different address ranges. Today, only range "one" is in use, so these two bits are neglected for the remaining discussion.

To make the programming of VCRs even more convenient and reliable, the VPV system (Videotext Programmed VCR) was developed (See "Videotext programmiert Videoheimgeräte (VPV)", Rundfunktechnische Mitteilungen, Heft 3, 1986).

Recording by means of VPV is directed by the automatic transfer of the necessary and correct information to the VCR from the TV program-pages of the teletext service, where the program to be recorded is selected. The user only has to display the appropriate teletext program page and then move a cursor to the desired program title. Upon pressing an appropriate button on the remote control, the necessary VPS program identification information is transferred to the VCR. As can be seen from comparing Figs. 4a and 4b, certain VPS data, indicated by the reference numerals 401 and 402 in Fig. 4b, are concealed (i.e. not displayed) under normal conditions and can be made visible by pressing a "reveal" button of the remote control transmitter. Figs. 4a and 4b also show that the concealed data indicated by reference numbers 401, 402 in the teletext TV program-pages correspond exactly to the actually transmitted VPS program identification code, except for a binary to decimal conversion. That is, the data indicated by number 401 corresponds to the sequence of country code (13) address field (1), program source (02), and date (300188). The data indicated by reference number 402 corresponds to the originally scheduled transmission times of the various programs (VPS times).

In the VPV application, if the user decides to record a program (see Fig. 4a) scheduled for example at 18:15, he simply moves the cursor to that position and after pressing the appropriate remote control push button, the relevant concealed data (see Fig. 4b) 3001 (day, month) 18:15 (hour, minutes) and 13102 (country, program source) are automatically transferred to a VCR. Note that the "1" in "102" represents address field one, bits number 0 and 1 of the VPS signal. Thereafter, the VCR continuously checks the transmitted VPS signal and upon coincidence the VCR starts to record.

It should be mentioned that the scheduled time 20:45 and the VPS-time 20:30 for "Movie II" of Fig. 4b are not identical. This is because the scheduled time has been updated in the meantime after it turned out that the sport event at 19:30 took longer than was expected when the program schedule

was first published. The VPS time always remains unchanged since it is assigned to the program and not to the actual time.

Thus, each of station identification (program source), scheduled transmission time and program title information for many different scheduled future TV transmissions are available for use by a VCR or television receiver equipped to process, respectively, VPS, VPV or teletext information. However, the user of a conventional television receiver is not able to utilize such information to full advantage. That is, while certain TV receivers (for example Grundig Models CUC 2600/2800) are equipped with a teletext decoding system and VCR's may be equipped with a VPS decoder (see "Decoder for an Automatic Video Program Identification System (VPS)", IEEE Transactions on Consumer Electronics, Vol. CE-32, No. 3, August 1986, pp. 162 - 168), the two decoding systems are not customarily included in a single apparatus.

It has been suggested (see IEEE Transactions article cited above) that a VPS decoder can be connected in an unspecified manner in a TV receiver for providing station identification or decoding of TV sound status. In addition, other types of decoder systems for retrieving supplementary data from a broadcast television signal have been proposed (see, for example, U.S. Patent No. 4,635,121 - Hoffman et al. granted January 6, 1987).

In any event, the number of receivable TV programs increases yearly due to the expansion of cable networks and satellite services. Unfortunately this development is confusing for the user and this confusion increases when a preferred program is time delayed from its originally scheduled broadcast time.

Therefore, it is desireable to provide support to the user through unambiguous station and program identification. The necessary information is available in a combination of the VPS and teletext signals and systems and methods are described whereby this combination of information can be processed for automatic visual presentation to the viewer.

SUMMARY OF THE INVENTION

In accordance with the present invention, a method of retrieving and displaying information transmitted in the vertical blanking interval of television signals is described wherein the television signals include image-representative information and a plurality of segments of accompanying supplementary information including program identification information having a time component, and a listing including program title information and program source information. The supplementary information is encoded, with at least the program identification information being disposed within vertical blanking intervals of related image-representative information and further being included within the listing. The method comprises tuning a television signal processor for selectively receiving signals transmitted by an individual program source, the received signals including image-representative information and accompanying segments of supplementary information, decoding the listing and the included program identification information, storing the decoded listing and included program identification information for subsequent retrieval and decoding the program identification information disposed within blanking intervals of related image-representative information. The method further comprises comparing the last-named program identification information with the included program identification information to identify matching information, and displaying at least program title information accompanying the included identification information upon identifying matching information.

In accordance with a further aspect of the present invention, apparatus for retrieving and displaying information transmitted in the vertical blanking interval of television signals is described wherein the transmitted signals include image-representative information and a plurality of accompanying segments of supplementary information including time-related program identification information, and a listing including program title information and program source information, the supplementary information being encoded during vertical blanking intervals of the television signal with at least the program identification information being disposed within vertical blanking intervals of related image-representative information and further being included within the listing. The apparatus comprises tuning means for selectively receiving signals transmitted by individual program sources, the received signals including image-representative information and accompanying segments of supplementary information, first signal decoder means for decoding the listing and the included program identification information, memory means for storing and retrieving at least the program title information and included program identification information decoded by the first signal decoder means. A first controller means is coupled to the first decoder means for selectively transferring the segments of supplementary information among the memory means, the first decoder means and the first controller means. A second signal decoder means is provided for decoding the program identification information disposed within blanking intervals of related image-representative information. The first controller means, upon initial reception of signals from an individual program source by the tuning

means, sequentially causes the second signal decoder means to decode the program identification information accompanying related image-representative information, thereafter causes the first signal decoder means to identify the same program identification information included within the listing and to store at least program title information of the listing in the memory means, the first controller means thereafter transferring the program title information from the memory means for display thereof along with related image-representative information.

THE DRAWINGS

In the drawings:

Figure 1 illustrates a composite video signal during the vertical blanking interval with VPS data on data line 16 and teletext data on lines 11-14 and 20-21;

Figure 2 illustrates the data format of the VPS information on data line 16;

Figure 3 illustrates the E.B.U. assignment of country codes;

Figure 3a illustrates country and source codes for the West German stations;

Figure 3b illustrates one example of VPS code corresponding to the second West German network, for the program of January 29, 1988 at 23:00;

Figures 4a and 4b illustrate, respectively, a single teletext program page (#303) in the "normal display" and "revealed" modes;

Figure 5 is a block diagram of a portion of a TV receiver constructed in accordance with the present invention and incorporating teletext and VPS decoders;

Figure 6 is a flowchart for a title search method in accordance with the present invention;

Figure 7 is a partial block diagram of a modification of the TV receiver of Figure 5 arranged to store program titles in advance;

Figure 8 illustrates a listing of TV programs available at a particular time, making use of VPS, VPV and teletext information; and

Figure 9 illustrates the manner in which station identification and program title may be displayed on screen in accordance with the present invention.

DETAILED DESCRIPTION

This invention relates to a system which automatically displays information such as program source (station identification) and the title of the running program, when the TV set or other TV signal processor has been turned on or when a new channel is selected. It is applicable in those countries using teletext or the like. The teletext system in Europe transmits, apart from other material, a listing of the updated TV program pages. To display the TV program title, one has therefore to select the appropriate teletext page from the listing.

That is, in order to display the title of the running program (i.e. the program which is being received and/or displayed) a search must be made to find the teletext page containing that program. Demanding a fixed page number is not reliable, since the various networks in Europe use different page numbers or change them occasionally.

The search is made according to this invention in a manner which is the reverse of programming a VCR by means of VPS and VPV. Thus the VPS program identification code of the received station is first read from the running program signal and then correlation in the teletext data stream is searched for.

Referring to the drawing, Fig. 5 shows part of the block diagram of a current TV receiver with a built-in teletext decoder circuit. A microprocessor (μP) (e.g. Siemens Type SDA 2011) U1 controls the various stages of the TV receiver by means of a control bus 20 upon receiving a command from an IR remote control receiver 21. The teletext decoder comprises a microprocessor U2, which controls, by means of an I^2C bus 22, the function of a CCT circuit U3 (CCT = Computer Controlled Teletext decoder). For a more detailed description of the I^2C bus 22, reference should be made to the Philips Technical Publication of 1986 entitled "I^2C Bus Specification". See also the Philips Data Handbook - IC 02a, published in 1986, with particular reference to the integrated circuits type SAA 5230 and SAA 5240 described therein.

In the receiver of Fig. 5, composite video is fed to a data slicer U4 (e.g. Siemens Type SAA 5230), which separates the serial teletext data stream from video and which provides a line-locked 6 MHz master clock frequency. Furthermore, a VPS decoder circuit U6, which is added to the standard TV chassis for purposes of the present invention, is connected to the I^2C bus 22 and is provided with composite video information. A suitable VPS decoder circuit is described, for example, in the Siemens publication "IC's for Entertainment Electronics", VPS System, Siemens, Edition 5 (1986) where the Siemens Type SDA 5232 and SDA 5640 IC's are shown.

The CCT circuit U3 provides a large number of different functions selectable via the I^2C bus 22. Essential for the title search is that data can be read from or written to a teletext memory U5 at any

desired memory location through the I²C bus 22. As a result, messages created in microprocessor U2 can be displayed on the screen of the TV receiver or microprocessor U2 can read and manipulate text stored in memory U5. Basically, the CCT circuit U3 decodes the incoming teletext data stream, stores the selected pages in memory U5 and provides R, G, B and blanking signals when the selected page is to be displayed on the CRT (not shown).

Referring to Fig. 6, the operating sequence according to one aspect of the invention will be described. The title search sequence is initialized upon selecting a new channel or when the TV set is turned on (see block 61). Microprocessor U2 reads the VPS code extracted from the accompanying image-representative video signal by VPS decoder U6 (block 62) and also forces teletext decoder U3 into the "don't care magazine - and page number" status (block 63). In this mode of operation decoder U3 ignores page numbers. It decodes the incoming teletext data stream byte by byte and writes the text into the memory U5. The microprocessor U2 reads the memory content and searches for the concealed VPV program identification information (block 64), transmitted along with the program pages (see Fig. 4b). The complete page however, cannot be read and analyzed before a new page appears, due to the fact that there is a speed limitation or bottleneck associated with the I²C bus 22. Therefore, microprocessor U2 is controlled, for example, to read only in those areas (lines and portions of lines) where the relevant concealed data is expected. Other search algorithms are possible.

Once correlation (a match or "yes" indications), between the VPS code of the running program and the concealed data in the teletext data stream is recognized, the appropriate text row, containing the title of the running program, is read into microprocessor U2 (block 65). Simultaneously, microprocessor U2 erases memory U5 via the I²C bus 22 and turns the acquisition circuit in teletext decoder U3 off. Thus, no further teletext data is decoded and memory U5 remains empty. The title of the running program is then transferred from microprocessor U2 into any desired location in memory U5. Finally the CCT circuit U3 is set into a mixing mode (block 66) thereby superimposing ("punching") the title onto the CRT (Fig. 9). Shortly afterwards teletext decode circuit U3 is forced into "standby" (block 67) and the title display operation is terminated.

This search operation would last indefinitely, should no correlation be achieved. This occurs if a weak signal is received and the teletext signal is not decodeable or when the TV set is connected to a VCR. An additional timerloop automatically terminates the search operation after 30 - 60 seconds, sufficient to allow the program-pages to reappear in the serial teletext data stream. Apart from the VPS decoder U6, no additional hardware is needed. The required software, see flow chart, Fig. 6, can be added into the ROM of the single chip microprocessor U2.

Some transmitters in Europe also provide program pages for a whole week in advance or pages from other stations. In order to achieve unambiguous operation the correlation for the relevant information i.e. country, program source code, date and VPS time must be obtained substantially simultaneously. If one element is not in correlation the complete search sequence is restarted by means of the "try again" loops 68 in Fig. 6.

Due to the serial nature of the teletext signal, it can take up to one minute to find and display the desired title. In order to make the titles available within a fraction of a second, an extra memory preferably is provided, which stores for each station the titles of a complete day's programs in advance.

Such a solution is feasible in Europe, where TV programs start late in the morning or only in the afternoon. The teletext service along with a test pattern however starts earlier, so there is time available between the beginning of the teletext service and the main program to search and store program titles. The VPS signal on data line 16 is also available when the test chart or pattern is transmitted.

Fig. 7 shows the block diagram of a solution allowing titles to be stored in advance. Fig. 7 is similar to Fig.5 except for a larger size memory U5 (such as the Hitachi Type HM 62256 - 32K Byte RAM) with associated additional address wires A14, A15, a software clock program (time of day) in microprocessor U2 and a transistor Q1. The transistor Q1 is connected between microprocessor U2 and a remote control input of the master microprocessor U1. The function of the software clock is to set the start of the title search sequence, e.g. at 9:00 or 14:00, when test charts and teletext are transmitted.

The remote control receiver 21 has an open collector output which is high when no IR commands are received. As a result microprocessor U1 can also be controlled by means of transistor Q1, for instance to select the channels when the title search sequence is in progress. Before this sequence is described, one must consider the requirements for the memory U5.

The teletext program tables are usually transmitted on three adjacent pages, each carrying a part of the day's program titles. The top third of a page contains the page title in large characters (Fig.4) and need not be stored. As a result, the

necessary space in memory U5 is two teletext pages only per channel. Such a page measures 40 columns by 24 rows (~1 K byte) and 2 K bytes of memory per channel are therefore sufficient. A part of the space in memory U5, namely 8 K byte, is reserved for normal teletext operation. As a result, if a 256 K bit (32 K byte) memory U5 is used, the titles of (32 - 8)/2 = 12 different stations can be stored. The appropriate number of channels for a 1 M bit memory is sixty.

Speed should also be considered in the improved advanced page storage version described above, since a complete program page must be processed, rather than a single title. One approach is first to memorize the page numbers (e.g. 303 in Fig. 4) of the program pages found. Here again the search operation is time limited to 30 - 60 seconds, after which the memorized pages are recalled, squeezed into two pages and stored in the desired location in memory U5.

It is possible that users may turn the TV set on while the search sequence is in progress. In that case, the search sequence has lower priority and the simpler "title search program" is activated, as described earlier. Later, when the user turns the TV set off, the advance page search sequence may continue.

When the TV set is switched off by means of the remote control, the set is in a "standby" mode and some circuits are still powered and fully operating. These are the master microprocessor U1, the remote control receiver 21, microprocessor U2 and memory U5, to maintain the software time of day clock and the stored titles in memory U5 (Fig. 7). But if the TV is switched off completely by means of the main switch, the software clock is "lost", but can be automatically reprogrammed the next time the TV set is turned on. This is obtained through reading the rolling or running time of day provided on each teletext page (Fig. 4) into the microprocessor U2 which in turn sets the time of the software clock.

Two-tuner-TVs are already on the market today, where the second tuner serves to provide a "Picture-in-Picture" function. This second tuner could also be used for the "Text-in-Picture" system described above. As a result, the conflict between watching TV and simultaneously searching for program titles in advance could be avoided.

Finally, it should be pointed out once more, that the systems described above are fully automatic and need no action by the user or additional buttons on the remote unit.

As previously mentioned, the large number of receivable TV programs makes an overview of available programs at a given time difficult to obtain. As a consequence, "channel hopping" becomes popular, even inevitable where the viewer hopes to get an idea about the content of the running programs. But instead, by channel hopping, the viewer gets only a "snapshot" which tells very little. A complete and accurate list of the titles of all current programs would be more useful.

Fig. 8 shows such a list, produced by using VPS and VPV information which is available in the described system. The list was created at 19:31, when the TV set was turned on, or may be provided on request, upon pressing button No. 0 on the remote control transmitter (not shown). This "0" button is not assigned to a particular channel but is used when a teletext page is selected (e.g. page 300). As a result another feature can be provided without the need for extra keys on the remote control.

The list of Fig. 8 can be generated in two ways. The accurate method is to use the various VPS identification times and search the appropriate titles in the memory U5, where all titles have been stored in advance. Since the TV set must first be swept through all stations in order to read the actual VPS time on data line 16, this method may last a few seconds. The second method is fast and uses the running time, which is transmitted on each teletext page, as its reference. However, it takes no account of program delays and is therefore less reliable.

Identification of the received station is another desirable feature and can be obtained by using country and program source codes of the VPS signal (Fig. 3b which illustrates the code for a program of January 29, 1988, transmitted by the second West German network (ZDF) at 23:00). After a conversion to characters by means of a stored look-up table, the station names can be displayed as shown in Figs. 8 and 9. The necessary look-up table is provided in the program ROM of the microprocessor U2 (Fig. 5). An agreement regarding the assignment of these codes to the various countries and TV stations already exists.

No sync and video signals are available when channel No. 0 is selected in order to display the program list. But sync at least is required to maintain the operation of the deflection circuits, when the list should be displayed. Fortunately, the data slicer U4 itself can produce an auxiliary sync signal when the external sync is missing (Fig. 7).

While the invention has been described in terms of one or more preferred embodiments, it will be apparent to persons familiar with this art that various modifications may be made within the scope of the invention which is stated in the following claims.

Claims

1. In a television signal processing system wherein the television signals include image representative information and a plurality of accompanying segments of supplementary information including program identification information, and a listing of program title information and program source information, the supplementary information being encoded during vertical blanking intervals of the broadcast signal with at least the program identification information being disposed within vertical blanking intervals of related image-representative information and further being included within said listing, signal processing apparatus comprising:
tuning means for selectively receiving television signals transmitted by individual program sources, the received signals including image-representative information and accompanying segments of supplementary information, first signal decoder means for decoding said listing and said included program identification information,
memory means for storing and retrieving at least said program title information and included program identification information decoded by said first signal decoder means,
a first controller means coupled to said first decoder means for selectively transferring said segments of supplementary information among said memory means, said first decoder means and said first controller means,
second signal decoder means for decoding said program identification information disposed within blanking intervals of related image-representative information,
said first controller means, upon initial reception of signals from an individual program source by said tuning means, sequentially causing said second signal decoder means to decode said program identification information accompanying related image-representative information, thereafter causing said first signal decoder means to identify the same program identification information within said listing and to store at least program title information of said listing in said memory means, said first controller means thereafter transferring said program title information from said memory means for display thereof along with related image-representative information.

2. Signal processing apparatus according to claim 1 wherein said second signal decoder means includes means for decoding program identification information comprising digitally encoded originally scheduled broadcast time and broadcast station identification characters.

3. Signal processing apparatus according to claims 1 or 2 wherein said listing comprises teletext information and said first signal decoder means comprises a teletext decoder system.

4. Signal processing apparatus according to claim 3 wherein said second signal decoder means comprises a VPV or VPT decoder system.

5. Signal processing apparatus according to claim 3 wherein said first controller means provides first control signals to said first signal decoder means, upon initial reception of a running program, to cause said first signal decoder means to search teletext transmissions for program identification information matching corresponding information provided by said second signal decoder means.

6. Signal processing apparatus according to claim 5 wherein said second signal decoder means comprises a VPV or VPT decoder system.

7. Signal processing apparatus according to claim 5 wherein said first controller means transfers program source information from said memory means for display along with said program title information.

8. Signal processing apparatus according to claim 5 wherein said first controller means is operative t cause said apparatus to sequentially search teletext transmissions for program source and country codes, determine occurrence of a match with corresponding information of the program indentification information of the running program and thereafter compare time-related identification information provided by said first and second decoder means.

9. Signal processing apparatus according to claim 1 whrerein said first signal decoder means and said memory means are activated to store program identification information and program title information prior to reception of image-representative signals.

10. A method of processing television signals wherein the television signals include image-representative information and a plurality of segments of accompanying supplementary information including program identification information having a time component, and a listing including program title information and program source information, the supplementary information being encoded during vertical blanking intervals of the television signal with at least the program identification information being disposed within vertical blanking intervals of related image-representative information and further being included within the listing, the method comprising:
tuning a television signal processor for selectively receiving signals transmitted by an individual program source, the received signals including said image-representative information and accompanying segments of supplementary information,

decoding said listing and said included program identification information,
storing said decoded listing and included program identification information for subsequent retrieval,
decoding said program identification information disposed within blanking intervals of related image-representative information,
comparing said last-named program identification information with said included program identification information to identify matching information, and
displaying at least program title information accompanying said included indentification information upon identifying matching program indentification information.

11. A method of processing television signals according to claim 10, wherein said step of displaying further comprises displaying accompanying program source information upon identifying matching program identification information.

12. A method of processing television signals according t claim 10 or 11 wherein said listing comprises teletext information and said program identification information disposed within vertical blanking intervals of related image-representative information comprises VPS information.

13. A method of processing television signals according to claim 12 wherein said step of decoding said listing comprises, upon initial reception of a running program, searching accompanying teletext transmissions for program identification matching the program identification information recurring during vertical blanking intervals of said running program.

14. A method of processing television signals according to claim 10 wherein said step of decoding said listing comprises searching teletext transmissions received during a run ning program or received and stored prior to reception of a running program.

15. A method of processing television signals according to claim 10 or 11 wherein said step of decoding said listing and comparing program indentification information comprises the partial steps of searching teletext transmissions for program source and country codes, obtaining a match with corresponding information of the program indentification information of the running program and thereafter comparing time-related identification information, obtaining a match of said time-related information and thereafter retrieving corresponding title information from memory for display.

16. A method of processing television signals according to claim 10 wherein said first signal decoder means includes means for decoding program title characters contained in said listing and further includes means for decoding program indentification information comprising digitally encoded originally scheduled transmission time and transmitting station identification characters.

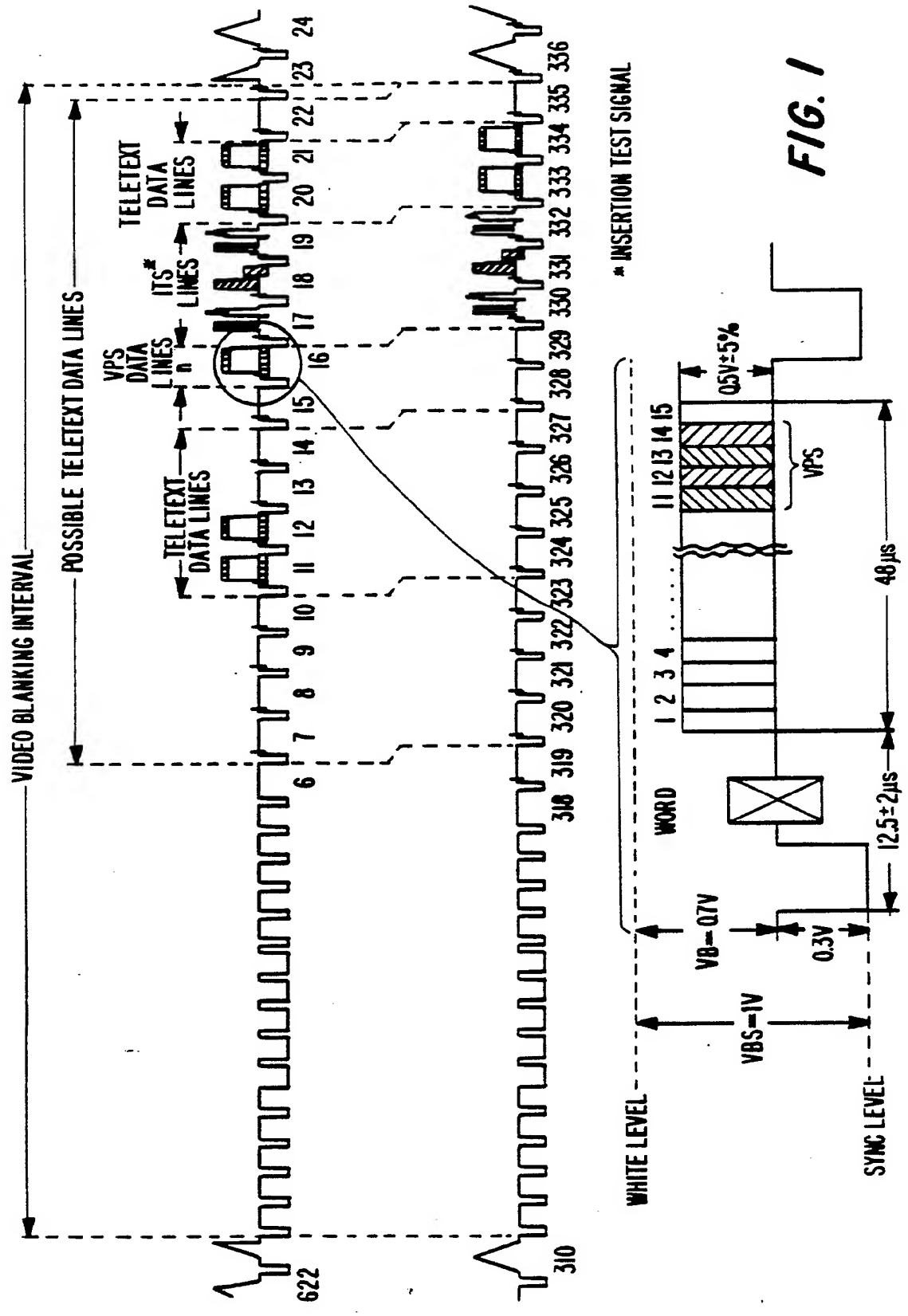

VIDEO BLANKING INTERVAL
POSSIBLE TELETEXT DATA LINES
TELETEXT DATA LINES
VPS DATA LINES n
ITS* LINES
TELETEXT DATA LINES
622
310
* INSERTION TEST SIGNAL
WHITE LEVEL
SYNC LEVEL
VB=0.7V
VBS=1V
0.3V
WORD
0.5V±5%
VPS
48µs
12.5±2µs

FIG. 1

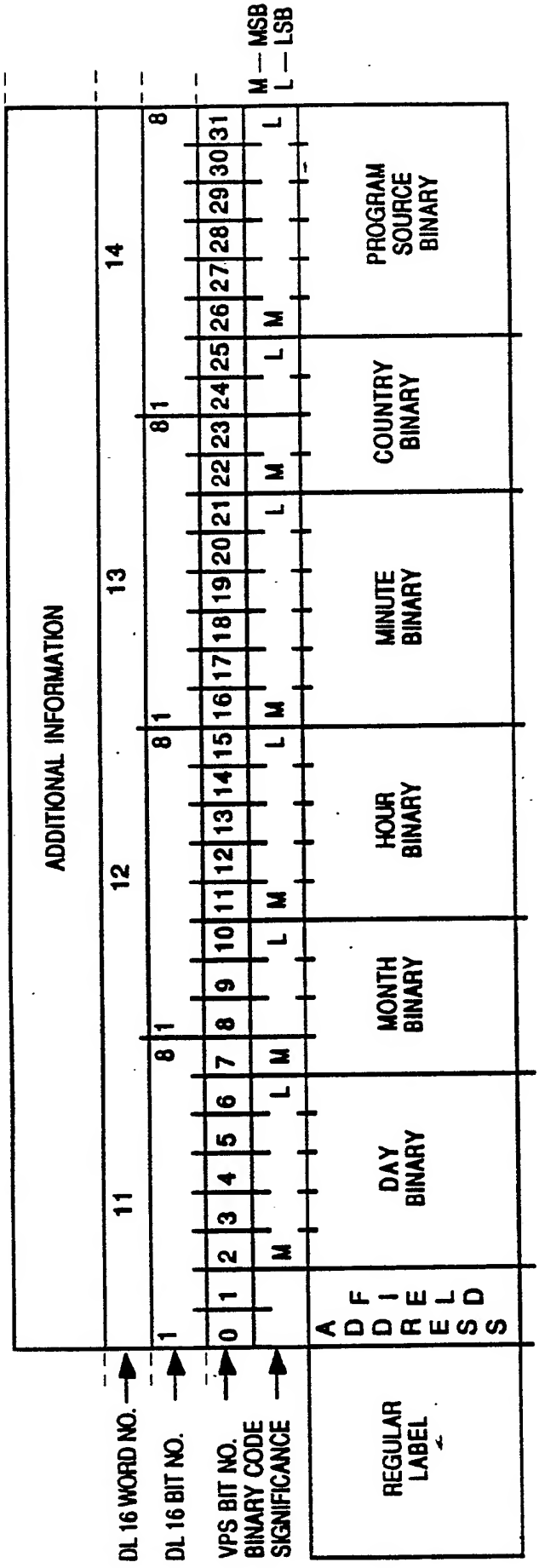

ADDITIONAL INFORMATION
REGULAR LABEL
ADDRESS
DAY BINARY
MONTH BINARY
HOUR BINARY
MINUTE BINARY
COUNTRY BINARY
PROGRAM SOURCE BINARY
M — MSB
L — LSB
DL 16 WORD NO.
DL 16 BIT NO.
VPS BIT NO.
BINARY CODE SIGNIFICANCE

FIG. 2

1	2	3	9	A	B	C	D	E	F
DDR	ALG	AND					D	CNR	EGY
GRC	CYP	SM					LBY	ROU	F
MRC	TCH	POL						E	NOR
	IRL	TUR							

FIG. 3

FIG. 3a

VPS CODE: BIT NO	COUNTRY MSB LSB 22 23 24 25	SOURCE MSB LSB 26 27 28 29 30 31	TO BE DISPLAYED	NO OF CHARACTERS
PROGRAM SOURCE				
1. ARD (1ST PROGR)	1 1 0 1	0 0 0 0 0 1	ARD	3
2. ZDF (2ND PROGR)	1 1 0 1	0 0 0 0 1 0	ZDF	3
3. ARD/ZDF (COMMON)	1 1 0 1	0 0 0 0 1 1	ARD-ZDF	7
4. SPARE	1 1 0 1	0 0 0 1 0 0		
5. SPARE	1 1 0 1	0 0 0 1 0 1		
6. ARD SAT	1 1 0 1	0 0 0 1 1 0	ARD-SAT	7
7. ZDF SAT	1 1 0 1	0 0 0 1 1 1	ZDF-SAT	7
8. SPARE AND 45. REGIONAL	1 1 0 1	0 0 1 0 0 0 / 1 0 1 1 0 1		
46. SPARE AND 63. CABLE	1 1 0 1	1 0 1 1 1 0 / 1 1 1 1 1 1		
	13 OR HEX D	1 TO 63		

FIG. 3b

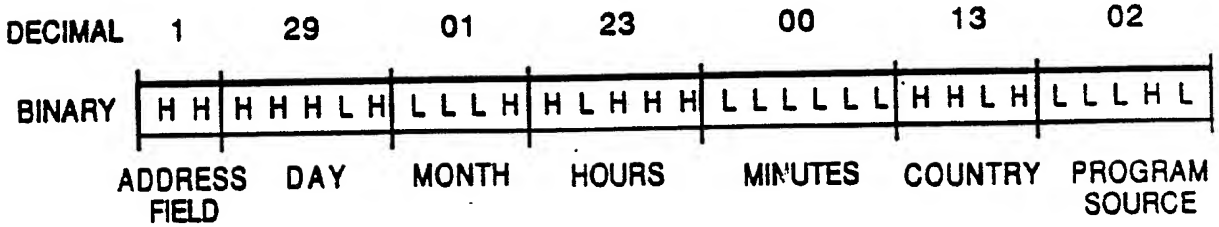
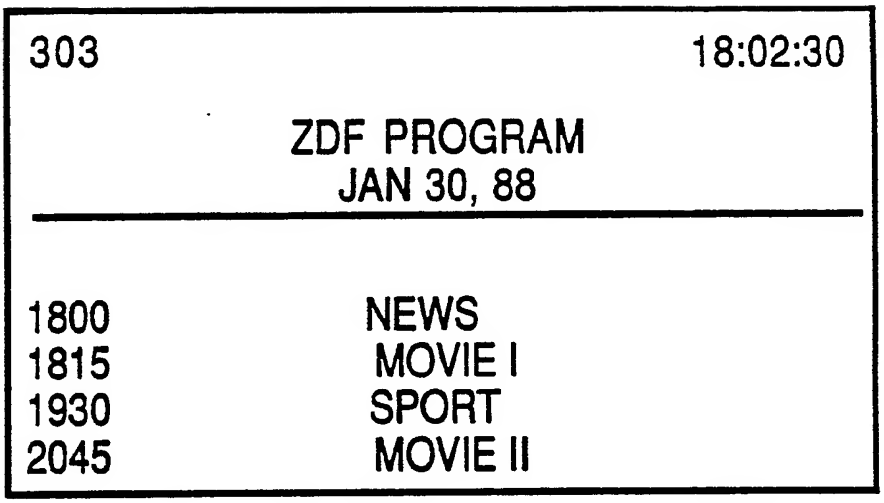


FIG. 4a


303
18:02:30
ZDF PROGRAM
JAN 30, 88
1800 NEWS
1815 MOVIE I
1930 SPORT
2045 MOVIE II

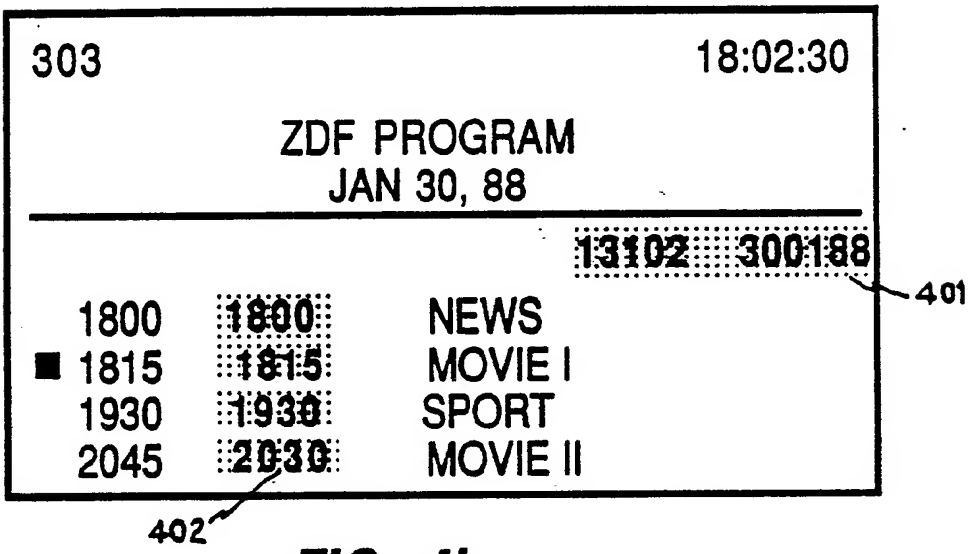

303
18:02:30
ZDF PROGRAM
JAN 30, 88
13102 300188
401
1800 1800 NEWS
■ 1815 1815 MOVIE I
1930 1930 SPORT
2045 2030 MOVIE II
402

FIG. 4b

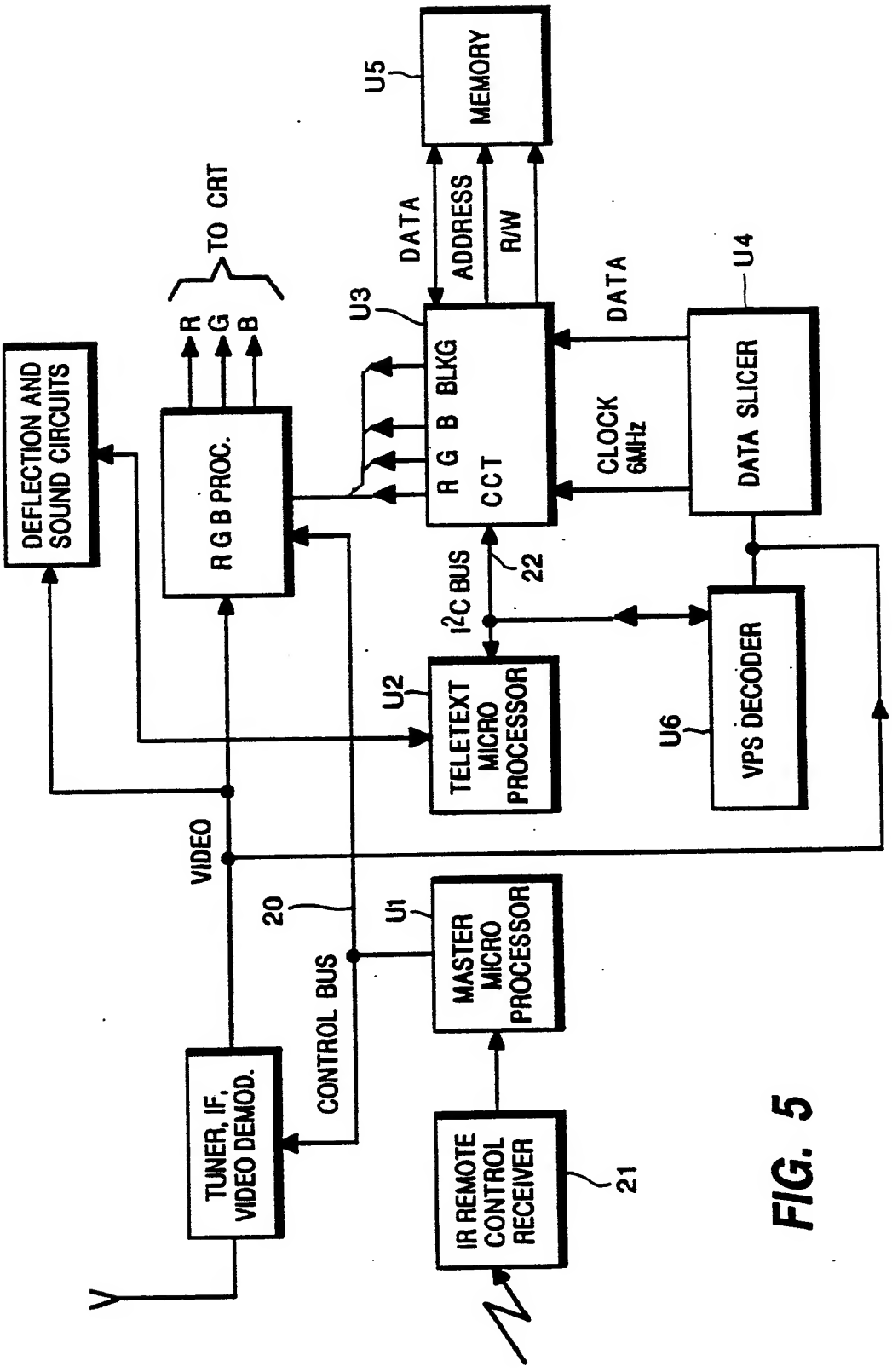

U5
MEMORY
DATA
ADDRESS
R/W
TO CRT
R
G
B
U3
DATA
U4
DEFLECTION AND SOUND CIRCUITS
R G B PROC.
R G B BLKG CCT
CLOCK 6MHz
DATA SLICER
I2C BUS
22
U2
TELETEXT MICRO PROCESSOR
U6
VPS DECODER
VIDEO
20
U1
MASTER MICRO PROCESSOR
CONTROL BUS
TUNER, IF, VIDEO DEMOD.
IR REMOTE CONTROL RECEIVER
21

FIG. 5

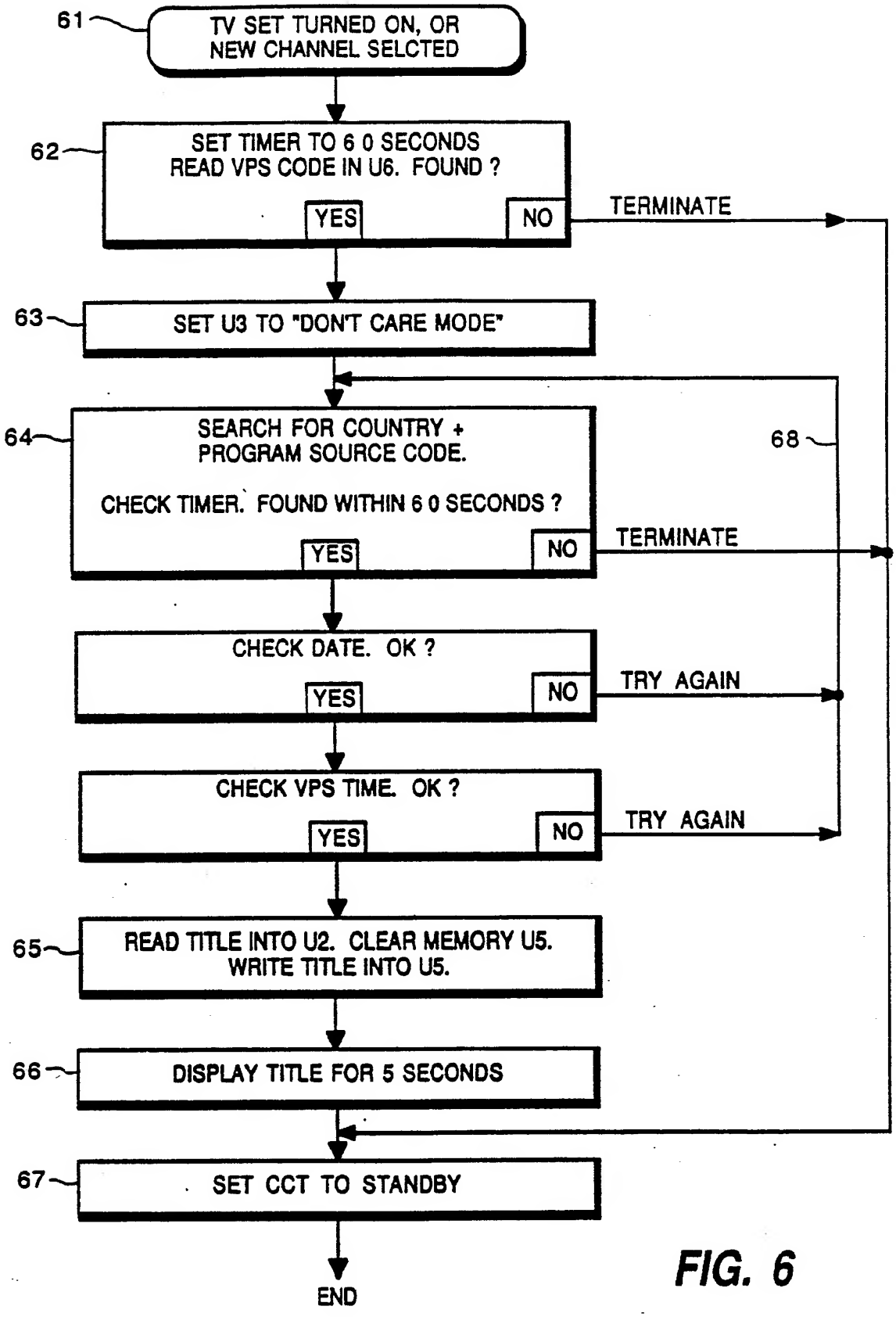

61
TV SET TURNED ON, OR NEW CHANNEL SELCTED
62
SET TIMER TO 6 0 SECONDS READ VPS CODE IN U6. FOUND ?
YES
NO
TERMINATE
63
SET U3 TO "DON'T CARE MODE"
64
SEARCH FOR COUNTRY + PROGRAM SOURCE CODE.
CHECK TIMER. FOUND WITHIN 6 0 SECONDS ?
YES
NO
TERMINATE
68
CHECK DATE. OK ?
YES
NO
TRY AGAIN
CHECK VPS TIME. OK ?
YES
NO
TRY AGAIN
65
READ TITLE INTO U2. CLEAR MEMORY U5. WRITE TITLE INTO U5.
66
DISPLAY TITLE FOR 5 SECONDS
67
SET CCT TO STANDBY
END

FIG. 6

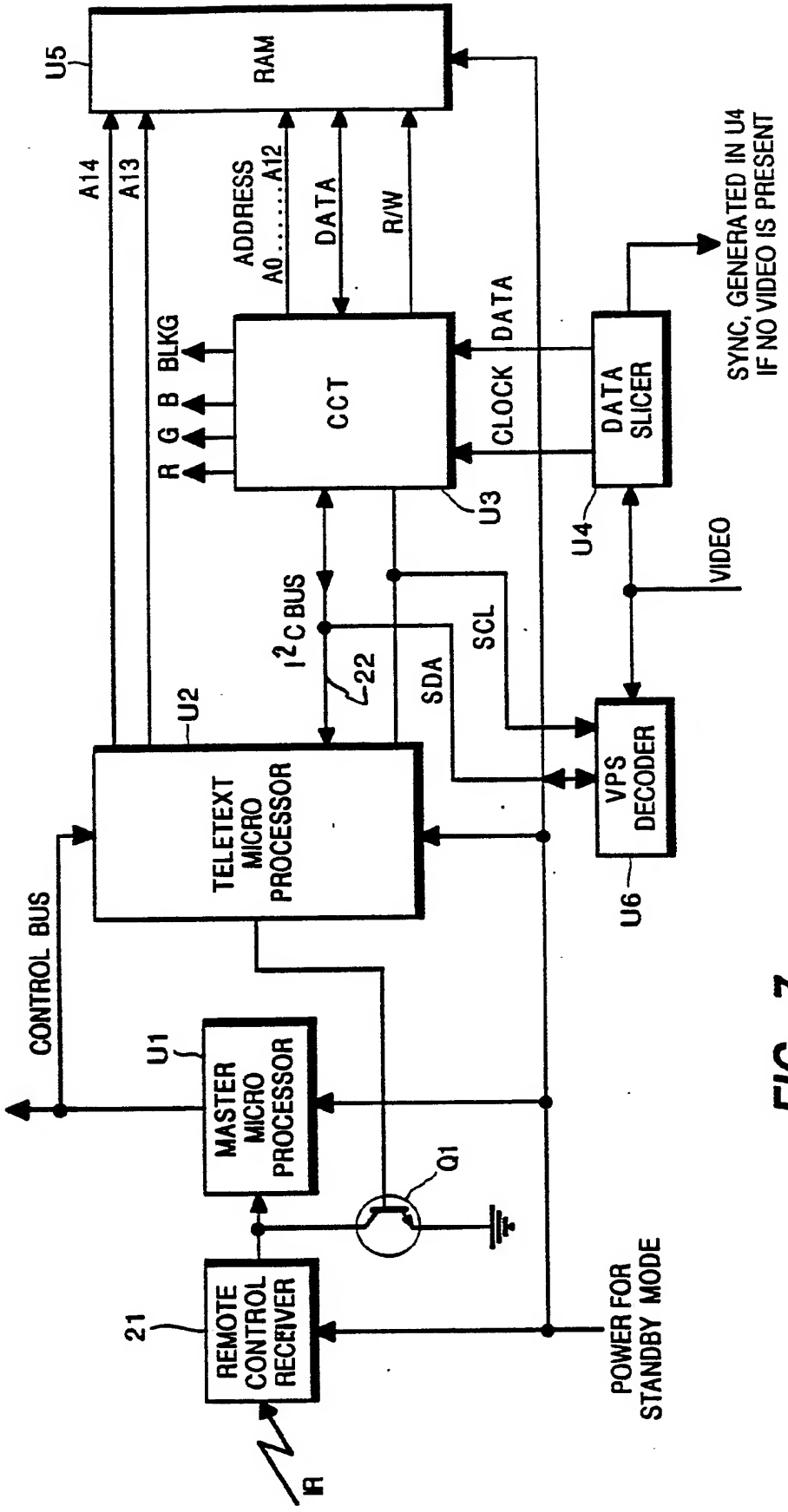

U5
RAM
A14
A13
ADDRESS
A0.....A12
DATA
R/W
R G B BLKG
CCT
DATA
CLOCK
U3
DATA SLICER
U4
SYNC, GENERATED IN U4
IF NO VIDEO IS PRESENT
VIDEO
I²C BUS
22
SDA
SCL
U2
TELETEXT MICRO PROCESSOR
VPS DECODER
U6
CONTROL BUS
U1
MASTER MICRO PROCESSOR
Q1
21
REMOTE CONTROL RECEIVER
IR
POWER FOR STANDBY MODE

FIG. 7

TELEVISION PROGRAM

#	STATION	PROGRAM	TIME 19:31
1	ARD	1900	TAGESSCHAU
2	SRG	1905	KARUSSELL
3	TSI	1900	TELEGIORNALE
4	ORF	1910	MINI ZIB
5	ZDF	1855	HEUTE
6	SWF	1850	BLICK INS LAND
7	TSR	1908	PETITES ANNONCES
8	FR3	1845	TAPIS VERT
9	ORF	1903	BETTHUPFERL
10	SKY	1920	HORROR SHOW
11	SAT	1855	TELE-ILLUSTRIERTE
12	BR1	1915	BLICKPUNKT SPORT

FIG. 8

FIG. 9